

REMARKS

Claims 1-9 are pending in this application.

Claim 1 has been amended to clarify that hydrogenation of the cooled process stream (into a hydrogenated process stream rich in methanol and depleted in aldehydes and ketones) is conducted at a temperature of 20-200° C, which is lower than an exit temperature during the production of methanol from the conversion of the feed stream into the converted process stream. The amendment to claim 1 obviates the 35 U.S.C. §112, second paragraph, rejection of this claim.

Claims 1-9 are rejected under 35 U.S.C. §103 as being unpatentable over Struder (U.S. Patent No. 5,179,129) ("Struder") in view of Laxier et al. (U.S. Patent No. 1,984,884) ("Laxier") and further in view of Dunn et al. (U.S. Patent No. 2,524,899) ("Dunn"). This rejection is respectfully traversed.

Struder discloses a process for the preparation of methanol in the liquid phase from synthesis gas. The process of Struder is performed in two stages by introducing the synthesis gas into a first reactor containing a methanol synthesis catalyst in an inert liquid; withdrawing an effluent from the first reactor comprising methanol, hydrogen and carbon monoxide; and introducing the effluent into a second reactor containing the same type of methanol synthesis catalyst in the same inert liquid as in the first reactor (claim 1). The purpose of contacting the effluent from the first reactor in a second reactor with a methanol synthesis catalyst is to produce additional methanol by reaction of remaining synthesis gas in that effluent (col. 3, lines 19-29 of Struder). Struder does not disclose or suggest (and, in fact, it does not even mention) the formation of ketones and aldehydes during synthesis of methanol. Struder does not even address the fact that formation of these compounds is a problem in a liquid phase methanol process.

Laxier relates to zinc chromite catalysts for use in hydrogenation and dehydrogenation processes (page 1, right col, ll. 41-49). This reference does not disclose any of the limitations of claim 1; Laxier teaches that, when used without addition of alkali metal compounds, the catalyst produces pure methanol from hydrogen and carbon monoxide, whereas inclusion of small amounts of alkali metals result in the formation inter alia higher alcohols, ketones, esters and aldehydes (page 2, left col, ll. 35-45). As Struder does not even mention the

formation of ketones and aldehydes during synthesis of methanol, and as Struder does not even address the fact that formation of these compounds is a problem during a liquid phase methanol process, the combination of the teachings of Laxier with Struder is based on hindsight.

Dunn is directed to purification of alkyl esters from a reaction mixture containing hydrocarbon and aldehyde impurities by distillation processes (col. 1, ll. 1-9). In particular, the purification method of Dunn is based on addition of a lower alcohol (e.g., methanol) to the reaction mixture in order to form azeotropes of the added alcohol with hydrocarbons being present in the mixture. Thereby, hydrocarbon impurities are easier to distil off from the mixture (col. 2, ll. 9-18). Following the removal of hydrocarbons in the form of azeotropes with methanol, for example, the residue is subjected to hydrogenation in presence of a catalyst to reduce aldehydes and ketones in the mixture to the corresponding alcohols, which are then separated from the residue to obtain a substantially pure alkyl ester product (col. 3, ll. 25-50).

The process of the claimed invention relates to methanol synthesis in the gaseous phase and the subsequent removal of aldehydes and ketones formed during synthesis of methanol. In particular, the process of the claimed invention is carried out by contacting a synthesis gas of hydrogen, carbon monoxide and carbon dioxide with a methanol synthesis catalyst to prepare in a first step a product effluent of methanol containing aldehyde and ketone impurities. In a second step, impurities contained in the methanol product are removed by contacting the effluent with a hydrogenation catalyst in order to hydrogenate aldehydes and ketones to their corresponding alcohols at a temperature lower than the exit temperature during the methanol synthesis step (claim 1).

Formation of undesired aldehyde and ketone impurities during synthesis of methanol is nowhere mentioned in the disclosures of Struder or Laxier. Cooling of an effluent stream is also not disclosed in these documents. Dunn relates to the removal of aldehyde and ketone impurities from a reaction mixture, as described above. In contrast to the claimed invention, these impurities are removed in the method of Dunn by hydrogenation of a distillation residue crude ethyl acetate.

The step of cooling an effluent stream from the methanol reactor and hydrogenation of the effluent stream in order to hydrogenate aldehydes and ketones is nowhere disclosed in Struder,

Laxier and Dunn. What is cooled in Struder is the inert liquid containing the methanol synthesis catalyst, i.e. the reaction mixture (claim 1, step (e)).

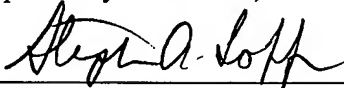
As shown on page 6, lines 5-1 of the present application, hydrogenation of aldehydes and ketones is favored by low temperatures. Furthermore, Fig. 1 and the associated description on page 6, lines 24-26, shows that cooling of the methanol effluent stream prior to hydrogenation allows a reduction of ketones by a factor of at least 100.

In summary, none of the cited references discloses, teaches or suggests all limitations of claim 1. Struder discloses a liquid phase process for the preparation of methanol. Laxier discloses a catalyst composition for the preparation of methanol or ketones and aldehydes. Dunn discloses a purification method of a crude mixture containing esters by means of distillation and hydrogenation. Consequently, these references, considered alone or in combination, do not disclose or suggest all limitations of the claimed invention, and they also relate to completely different techniques.

Allowance of all pending claims is solicited.

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